



MEETING SUMMARY

TRANS-LAKE WASHINGTON PROJECT TECHNICAL COMMITTEE MUSEUM OF HISTORY AND INDUSTRY, SEATTLE, WA NOVEMBER 15, 2000, 9:30 A.M.— 11:30 NOON

WELCOME AND AGENDA REVIEW

Pat Serie, EnviroIssues, welcomed the committee members and began the meeting by introducing Les Rubstello, Washington State Department of Transportation, who will be teaming with Rob Fellows in the capacity of engineering project manager. The purpose of the meeting was to review the preliminary feasibility assessment of tunnels and tubes across Lake Washington, and learn about Sound Transit's program for reviewing high capacity transit technologies. Discussion would be held on both topics, and no decisions were expected. There were no changes made to the agenda.

FEASIBILITY OF TUNNELS AND TUBES

Jeff Peacock, Parametrix, presented preliminary results on the feasibility of tunnels and tubes across Lake Washington. Hans Saxer, from Parsons Brinckerhoff and the lead structural engineer on the project, also participated in the presentation.

Tunnels were examined during the Trans-Lake Study, and there were indications that tunneling would be technically challenging, and very expensive. The Discovery Institute's presentations on tunnels and tubes, as well as scoping comments, have prompted the Trans-Lake Project to take a more detailed look at tunnel possibilities. The presentation outlined local considerations, tunnel concepts for crossing Lake Washington, and preliminary cost data. Feedback from the Technical Committee would be sought prior to taking the results to the Executive Committee.

Assumptions made for this level of study and for in presentation are the following:

- For the purpose of study, alignments would be assumed to be straight across the lake, connecting points directly opposite on either side of the lake. The alignments were used to develop a profile of what a lake crossing would look like, and the depths to which tunnels or tubes would need to descend within the lake. Alignments shown on the map are fairly arbitrary, and do not represent any alignment decisions. There are no limitations to how actual alignments might look, including the possibility of touching the northern tip of Mercer Island in a mid-lake crossing.

- Tunnels outlined and characterized in the presentation only represent necessities for water crossings, and make no assumptions about land-side tunneling possibilities.

Three technologies were analyzed: 1) bored tunnels; 2) submerged sunken tunnels; and, 3) submerged floating tubes. A 1968 study of lakebed characteristics revealed 200 – 220 feet of water, with an additional 150 – 250 feet of soft sediment on the bottom of the lake. This has large impacts on the applications of tunnels to this project. Considerations for each technology and ensuing discussion points are highlighted below.

Bored Tunnels

Bored tunnels require tunneling machines through hard material to maintain the structural integrity of the tunnel. The largest bored tunnels are 50 feet in diameter. Assuming construction of eight lanes, at least two bores, and possibly a third, would be required.

- Fifty foot diameter tunnels at depths required (~500 feet); have never been done; and a 30 foot diameter would be more reasonable.
- Layers below the soft sediment may prove problematic, especially if they are composed of glacial till.
- Bored tunnel fixed constraints include a 4.5% grade, posing difficulty for trucks and buses, connections from I-5 to I-405 only with nothing in between.
- Ventilation would require substantial structures on both sides of the lake, with at least four structures anticipated.

Discussion of the bored tunnels raised the following points:

- An earthquake fault along the route may present technical challenges.
- The possibility of treating air as it is released through ventilation shafts might be an advantage. The technical team did not have information about treatment possibilities.

Sunken Submerged Tunnel

Prefabricated sunken submerged tunnel sections could be joined at the surface and sunk to the lake bottom, or sunk and then joined. A smooth bed would need to be prepared on the lake bottom, which is typically a dredged area, but could be a raised bed. The tunnel would then be covered with a protective riprap.

- Tunnel grade would need to 4.5% to get to the lake bottom, but the length of the tunnel would be much shorter.
- Transition zones would be necessary where the tunnel from the ground meets the sunken tube under water. This would likely require a coffer dam to be built to complete the work, down to a depth of 200 feet. This would present a technical challenge.

- Landside tunneling would be required, which could use either bored or cut and cover technologies.

Discussion yielded the following points:

- Sunken tunnels along the side slopes of the lake would be difficult because of the steep 15% grade.
- U.S. Army Corps of Engineers may raise issues with dredging and filling on the lakebed. The Endangered Species Act, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the Environmental Protection Agency may also raise their own issues.
- Ventilation shafts would still be needed on both sides of the lake.
- The tunnel would likely be shorter than a bored tunnel, with portals between the water and I-5 and the water and I-405.

Submerged floating tunnel

A floating tube would cross the lake, with the top of the tunnel at a distance below the lake surface to enable navigation. The tunnel would be anchor or pier supported. The approaches to the tunnel on the landside would be much shorter, and the grade also would be significantly more gradual. There is the possibility of creating an artificial island at the transition between the tunnel and the land-side highway.

- No floating tunnel is yet in existence, though a project in Finland is in the later stages of design.
- Though the approach to the tunnel would not need to be as long for the floating submerged tunnel, a question to consider would be the logic of submerging the water crossing without placing land-side highways underground to gain those environmental benefits.

Summary

In summary, tunnels would be expensive and risky in both cost and the schedule. The three options laid out here are all at the cutting edge of technology, though the project would likely be able to handle the technical challenges involved, including the design of the floating submerged tunnel. Portals and ventilation structures for all designs would be fairly large. The environmental impacts appear to be addressable. Connections at I-5 would be difficult.

Very general cost estimates were described for each of the options, though they included only the cost of the tunnel across the lake and associated ventilation facilities. Land-side facilities were not included.

Ventilation structures for transit-only tunnels would need to be the same size to accommodate fire and other disaster possibilities. The ventilation units would not need to be running constantly, however, because of the significantly lower amounts of exhaust. General conclusions

made for highway tunnels may not hold true for transit technologies, especially in terms of grade restrictions.

Pedestrian and bicycle lanes are not certainties in tunnels, because of potential space constraints as well as ventilation issues. Prefabricated solutions (sunken submerged and floating submerged tunnels) may offer more flexibility in terms of accommodating pedestrians and bicycles.

General Discussion

Summaries of discussion points are captured below.

- Cost estimates given are for capital costs of the tunnel, and these were compared to capital costs of a floating bridge. It might be reasonable to ask for cost estimates which include the life-cycle and maintenance costs of both types of structures, as a way for a more complete comparison.
- Comparisons with other tunnels in existence (English Channel Tunnel, a new Japanese tunnel) would be very helpful to understand how a Lake Washington tunnel would differ in terms of depths, technical challenges, lengths, grades, etc., as well as life span assumptions. The project team agreed to produce this.
- The advantages of tunnels promulgated by the Discovery Institute should be compared to the conclusions presented here.
- A tunnel project under Lake Washington will push the limits of working designs, indicating a need for a large amount of study and design. The urgency of the project may be at odds with the engineering analysis and design needs.
- The conclusions of the presentation do not paint a positive picture for tunnels, but a transit-only tunnel might be combined with a bridge.
- Tunnels don't address the bridge issue and the costs of handling SOV and highway traffic. However, cost is not the number one issue in the EIS process, more information on environmental issues should be sought before a decision is made not to consider tunnels any further.
- Differences in cost estimates of tunnels to other build alternatives may not be as severe when mitigation and other costs are included. Cost estimates given in relation to the cost of replacing the bridge may therefore not be appropriate.
- Tunneling should be evaluated for its merits and gains as a return on the costs.
- The differences between the HCT application of tunnels and highway application of tunnels needs to be highlighted.

- Jeff Peacock stated that the issues with each of the different technologies are quite different, but each has significant risks. The risks must be recognized when making the decision.

Jeff Peacock stated that feedback from the Technical Committee will be described to the Executive Committee for agreement about the applicability of tunnels for crossing the lake. Any decision to remove tunnels from further consideration will be documented, and will confirm the decision of the Trans-Lake Study Committee to not consider cross-lake tunnels as a viable option. Jeff Peacock suggested not expending resources to further investigate the bored tunnel; he stated his professional opinion was on the edge of being wholly unpractical. There was no committee disagreement with this statement.

However, discussion did turn to a bored transit-only tunnel. Hans Saxer said that this might be done in a single bore, separating the two sides. The HCT grade limit would likely be around 5%, and would need to meet the proposed Sound Transit Link tunnel at 15th Avenue NE on the Westside. Sound Transit is reviewing that option, and is raising issues about whether it should be pursued.

There was a suggestion to set an alignment along the slope of the lakebed sides rather than straight down, thereby decreasing the grade. Hans Saxer stated that the increases in length are a potential problem, and stable slopes would need to be assured.

There was some support in the committee for removing the tunnel options, confirming the recommendations of the Trans-Lake Study Committee, and not spending more money on tunnel feasibility studies. There was also support for continuing feasibility studies, and not removing them based on gross cost. Further comments can be directed to Jeff Peacock.

Pat Serie stated that the tunnel information will be discussed by all three committees on January 10, 2001. Jeff Peacock stated that permutations and concepts for all the alternatives will be developed, and that tunnels fit into the category of some of those permutations. The issue will be the key differentiating factors that make tunnels feasible or unfeasible. Jeff didn't envision taking the cross-lake tunnel into the second level screening unless the Executive Committee felt it needed to be further analyzed, tunnels don't seem to warrant spending more resources.

ALTERNATIVE TRANSIT TECHNOLOGY ASSESSMENT

Nick Roach, Sound Transit, and Bruce Abernethy, Bucher, Willis and Ratliff, presented Sound Transit's Alternative Transit Technology Assessment (ATTA), an effort to look at alternative transit technologies that could be carried into the future. This effort is part of the partnership with the Trans-Lake Project to save money and resources while identifying options that may be carried forward into the further analysis.

Sound Transit's budget in 1995 set \$30 million for research and development to improve service and reduce dependency on SOVs. Alternative transit technologies receive 20% of that budget to examine opportunities beyond existing bus and rail. Thus far eleven projects, mostly intelligent transportation systems, have been developed as part of the Sound Transit R&D program. The Alternative Technologies Assessment is a single project in the R&D program.

The assessment tasks will take a high level look at express bus, bus, and rail for alternative technologies, highlight the most promising technologies to receive further funds, and provide enough information to the Trans-Lake Project to carry two to four of those options forward for further consideration.

An expert review panel will be convened starting at the end of November, 2000, and will produce a final report at the beginning of June, 2001. Three screenings will take place after an initial brainstorming session. The first stage screening will be a fatal flaw, high clip overview, that identifies unacceptable risks, unacceptable environmental impacts, foreign ownership, or grade restraints. The second stage screening will determine candidates' potential implementation based on quantitative impacts, and stage three will look at the possible scenarios for use.

The assessment team will be looking to the Trans-Lake committees for feedback on the stage one screening. Feedback and other technologies that should be included in the process can be directed to Barbara Gilliland, Sound Transit.

Susan Sanchez, City of Seattle, stated that the city is doing a transit study to evaluate potential ridership through specific corridors, sample routes, and particular technologies. That report is due in February, 2001. She asked how the ATTA work will relate to the analysis to be completed in Seattle. Nick Roach stated that the report will not be a detailed narrative of options, but will produce a matrix of reasonable comparisons. Applications to particular corridors will be noted as presented.

Barbara Gilliland stated that the timeframe for the study presents challenges to conducting outreach. However, outreach ideas will be considered. Len Newstrum asked again that there be some consultation with the I-405 project.

Other comments included:

- Criterion on modal transfers should be looked at, and transfers considered as a negative quality.
- Will the automotive industry be consulted for information collision avoidance?
- Reports should be distributed to the committees along with regular briefings during the process.

Pat Serie stated that the ATTA will be on the agenda for January 10, 2001, with follow up as appropriate. Feedback can be directed to Nick Roach, roachn@soundtransit.org. The project website is www.rttg.org.

MEETING SCHEDULE

The next meeting will be a joint committees meeting on January 10, 2001.

MEETING HANDOUTS

- Agenda Agenda
- Alternative Transit Technology Assessment Report, Memo from Sound Transit, November 9, 2000
- Alternative Transit Technology Assessment Report Project
- Alternative Transit Technology Assessment Presentation
- Tunnel Technology Assessment Presentation

MEETING ATTENDEES

Committee Members

Present	Name		Organization
X	Arndt	Jim	City of Kirkland
	Billen	Don	Sound Transit
X	Bowman	Jennifer	Federal Transit Administration
	Brooks	Allyson	Washington State Office of Archaeology and Historic Preservation
	Conrad	Richard	City of Mercer Island
	Cushman	King	Puget Sound Regional Council (Pete Beaulieu)
X			
X	Dewey	Peter	University of Washington
	Fisher	Larry	Washington State Department of Fish and Wildlife
X	Francis	Roy	King County Department of Transportation
	Gibbons	Tom	National Marine Fisheries Service
	Kennedy	Jack	U.S. Army Corps of Engineers
	Kenny	Ann	Washington Department of Ecology
	Kircher	Dave	Puget Sound Clean Air Agency
	Leonard	Jim	Federal Highway Administration
X	Marpert	Terry	City of Redmond
X	Newstrum	Len	Town of Yarrow Point
X	Pratt	Austin	U.S. Coast Guard, 13 th District
X	Rave	Krista	U.S. Environmental Protection Agency
X	Sanchez	Susan	City of Seattle
X	Schulze	Doug	City of Medina
	Sparrman	Goran	City of Bellevue
X			(Bernard van de Kamp)
X	Sullivan	Maureen	WSDOT – NW Region
	Teachout	Emily	U.S. Fish and Wildlife Service
X	Wasserman	Mitch	City of Clyde Hill
X	Willis	Joe	Town of Hunts Point

Other attendees

Steve Lewis, BWR
Bruce Abernathy, BWR
Carrie Deichl, FTA
Paul Carr, PSCAA
Jean Amick, Laurelhurst Community Club

Project Team

Rob Fellows, WSDOT
Les Rubstello, WSDOT
Jeff Peacock, Parametrix
Lorie Parker, CH2M Hill
Pat Serie, EnviroIssues
Cathy Strombom, Parsons Brinckerhoff
Kim Farley, WSDOT
Hans Saxer, Parsons Brinckerhoff
Paul Hezel, EnviroIssues

PJH